

DUNE MANAGEMENT ASSESSMENT

An Assessment of the
Feasibility of Foredune
Management and View
Grading for Five
Communities Along the
Oregon Coast

July 1989

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Department of Land Conservation and Development

Court Street, NE
Oregon 97310

Introduction

Oceanfront dunes in developed areas are often viewed as a nuisance. In a few short years, grass-covered dunes can grow up until they block previously unobstructed views from oceanfront homes. Unvegetated dunes can in days or weeks either bury or scour homes along the shore.

In 1984, the Land Conservation and Development Commission amended Statewide Planning Goal 18 to allow dune grading for view maintenance. The Goal requires preparation of an areawide dune management plan as a prerequisite for grading.

Only one area has thus far adopted a dune management plan. This assessment briefly analyzes the potential for dune management in five other oceanfront communities: Gearhart, Seaside, Pacific City, Neskowin, and Bayshore.

The assessment provides some basic information about each of these areas and the condition of its foredunes and any unique or challenging circumstances for grading.

Although funding for additional dune management plans is not currently available, interest in nonstructural means of erosion control, including dune management, is increasing. This study is designed to provide background information for future planning if interest and resources in dune management become available.

Financial assistance for the preparation of this document was provided to the Department of Land Conservation and Development by the Office of Ocean and Coastal Resource Management (OCRM) of the National Oceanic and Atmospheric Administration (NOAA) through a coastal program implementation grant to the state made pursuant to Section 306 of the Coastal Zone Management Act of 1972.

DUNE MANAGEMENT ASSESSMENT

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BACKGROUND

The purpose of this assessment is to determine the need for, and limitations on, dune management planning in five areas along the Oregon Coast. So far, dune management under Implementation Requirement 6 of Goal 18 has only been done at one location. Since every location is to some extent unique, this assessment is intended to identify any notable differences that might affect management in these other areas.

The five communities selected are most likely, in the Department's opinion, to proceed with dune management. Property owners and/or local governments in each of these communities have expressed interest in developing a foredune management plan. Two of the five communities (Seaside and Pacific City) have done some work toward preparing a dune management plan.

Reviewing these communities together also provides the Department an opportunity to analyze the overall need for and likely effects of dune management. Taken together, these five communities cover ten miles of oceanfront shoreline. This is a good portion (perhaps one half) of the amount of developed foredune shoreline along the Oregon Coast. These five stretches of shoreline represent a range of different physical settings, both in terms of the dune landforms, the extent of development and dune alteration, and the likely hazards. In short, they reflect the range of dune management issues that are likely to be encountered on the Oregon coast.

METHODOLOGY

This assessment is based on review of available published information, aerial photography, and brief site visits by DLCD staff.

Aerial Photographs

Aerial photographs reviewed include Oregon Department of Transportation (ODOT) beach zone line photographs (1978 and 1984), produced at a 1" = 200' scale. These photographs provided sufficient detail to detect key aspects of the dune on an almost lot-by-lot basis. The photos were reviewed to assess erosion and accretion, changes in vegetative cover, and other alterations such as grading or mowing. The Department has also reviewed color aerial photography provided by the Corps of Engineers (1978 and 1986). The 1978 photos at a uniform scale of 1:12,000 provided sufficient contrast, with magnification, to confirm the somewhat fuzzier information on the ODOT beach zone line aerials. The 1986 Corps photos at larger scales varying from 1:24,000 to 1:48,000 provided too little resolution for an accurate measurement of dune changes, although major changes were discernible.

DLCD staff compared available photography to attempt to measure or characterize changes in individual areas from 1978 to 1984. These time periods have some significance. The 1978 photos were taken one year after the effective date of Goal 18 (and the other coastal goals). As of January 1, 1978, coastal cities and counties were required to enforce Goal 18's provisions regulating foredune development and alterations. Consequently, the 1978 photos are a good visual record of the status quo at the time the goals went into effect. The winter of 1977-78 was also a high erosion year. Several foredune areas (including portions of Pacific City and Neskowin) were ripped at this time.

The 1984 photos slightly predate the October 1984 amendments to Goal 18 which authorized limited foredune grading. They also provide a good representation of the status quo for subsequent dune management efforts. 1986 photos have been used to assess other major changes.

Site Visits

In April and May of 1989, DLCD staff walked each of the foredune segments. The purpose of these visits was threefold. First, to identify any major changes from the aerial photographs. Second, to more fully assess the on-the-ground conditions, especially condition of the dune and stabilizing vegetation and height of the dune in relation to oceanfront homes. Third, the site visits provided an opportunity to confirm observations about appropriate management measures.

Floodplain Mapping

The Department has assembled the Flood Insurance Rate Maps (FIRMs) for each of the five communities. These maps were prepared by the Federal Emergency Management Agency (FEMA) and its predecessor, the Flood Insurance Agency (FIA). This mapping was prepared and adopted between 1978 and 1980. FEMA mapping is important as a baseline for dune management for several reasons.

Floodplain mapping is important to dune management because Goal 18 sets the minimum elevation for graded dunes at four feet above the 100-year velocity flood elevation established by FEMA. The FIRM maps were consulted to determine the extent of ocean flooding in each community. Several communities have areas which are subject to different velocity flood heights. (Velocity flood elevations in the five communities vary from 19 to 34 feet.)

FEMA's mapping is also important because FEMA regulations, implemented by cities and counties, regulate alterations to dunes in velocity flooding areas. The key federal regulation (44 CFR 60.3(e)(7)) prohibits any man-made alteration of sand dunes in velocity zones which would increase potential flood damage. However, since the regulation is no more specific than this (and consequently not well understood), it is less than diligently enforced by local governments. Nonetheless, it reflects the importance of dunes in providing flood protection.

FEMA has recently promulgated a new rule which is likely to have a major impact on development in foredune areas. Effective October 1, 1988, FEMA changed the definition of the velocity flooding area to include all primary frontal dune areas as V-zones. This means that when velocity flood zones are remapped, they will extend inland to at least the landward toe of the frontal dune. This will result in a number of areas along the Oregon coast being reclassified as V-zones.

FEMA's regulations have also been updated to establish minimum dune dimensions to provide adequate flood protection from a 100-year flood event.

Subarea Segments

Each of the communities analyzed has been divided into subareas for the purpose of more detailed evaluation. Subarea boundaries are set to combine stretches of shoreline with common dune and development characteristics. This is helpful in characterizing areas and is essential to prescribing appropriate management techniques. Subarea boundaries are set at points where there is a distinct change in either the dune or the pattern or location of development on the dune.

Subarea Characterization

A variety of information is provided on each subarea:

Shoreline length is the length of the beach as measured along the beach zone line. This is a series of straight lines parallel to the coast between identified survey markers. At the mouths of rivers and creeks, the beach zone line typically turns perpendicular to the shore. These areas are also included in the measurement of shoreline length.

The four areas analyzed ranged in length from 8,000 to 11,625 feet. Individual subareas were typically between 1,000 and 2,500 feet long but were as short as 575 feet and as long as 4,850 feet.

Number of Houses: The number of separate residences clearly apparent on aerial photos is shown. This number may not be completely accurate for three reasons. First, large accessory structures (garages, decks etc.) are often difficult to distinguish from small houses. Second, houses in dune areas tend to be placed close to one another. This can further blur the distinction between houses and other structures. Third, light or reflective roofs do not contrast well with sand and may not show up on photos.

Seaside, Gearhart and Neskowin each have hotels, motels or condominium complexes located on foredunes. Each complex is counted and listed separately. No effort has been made to count the number of individual rooms or units.

Distance to the Beach Zone Line: This is an estimate of the distance between oceanfront homes and the beach zone line. The average is the typical setback for homes in a segment. The range indicates the furthest and the closest homes from the line. The line is also a general indicator of the landward limit of the dry sand beach in 1969 when the line was established. Comparing the present location of the dune relative to the line can indicate whether the dune has eroded or accreted over the last twenty years.

Foredune Width: An estimate of the distance between the oceanfront home and the seaward limit of foredune vegetation. Because foreslopes are typically poorly vegetated, it is difficult to precisely establish the oceanward limit, or "toe," of the foredune. Consequently these are rough estimates, and may vary as much as 20 to 30 feet or more from on-the-ground conditions. In graded and other unvegetated areas, the toe of the foredune is considered to be the same as vegetated areas immediately up and down shore.

Beachgrass Cover: A rough estimate of the percentage of cover versus open sand based on available aerial photography. No comprehensive effort has been made to determine which type of beachgrass -- European beachgrass or American dune grass -- exists in each area.

Flood Elevation: The velocity flood elevation as indicated on FEMA Flood Insurance Rate Maps. Flood elevations varied from 19 feet in parts of Neskowin to 31 feet in parts of Bayshore. The flood elevation is critical because it dictates the elevation to be established after grading. (Goal 18 requires that the dune be maintained at four feet above the 100-year flood level.)

SUMMARY CHARACTERISTICS OF DEVELOPED FOREDUNE AREAS

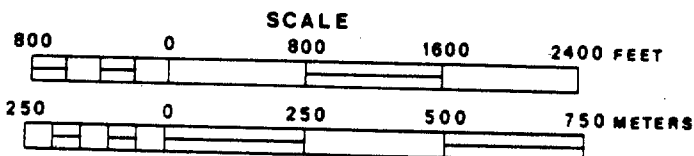
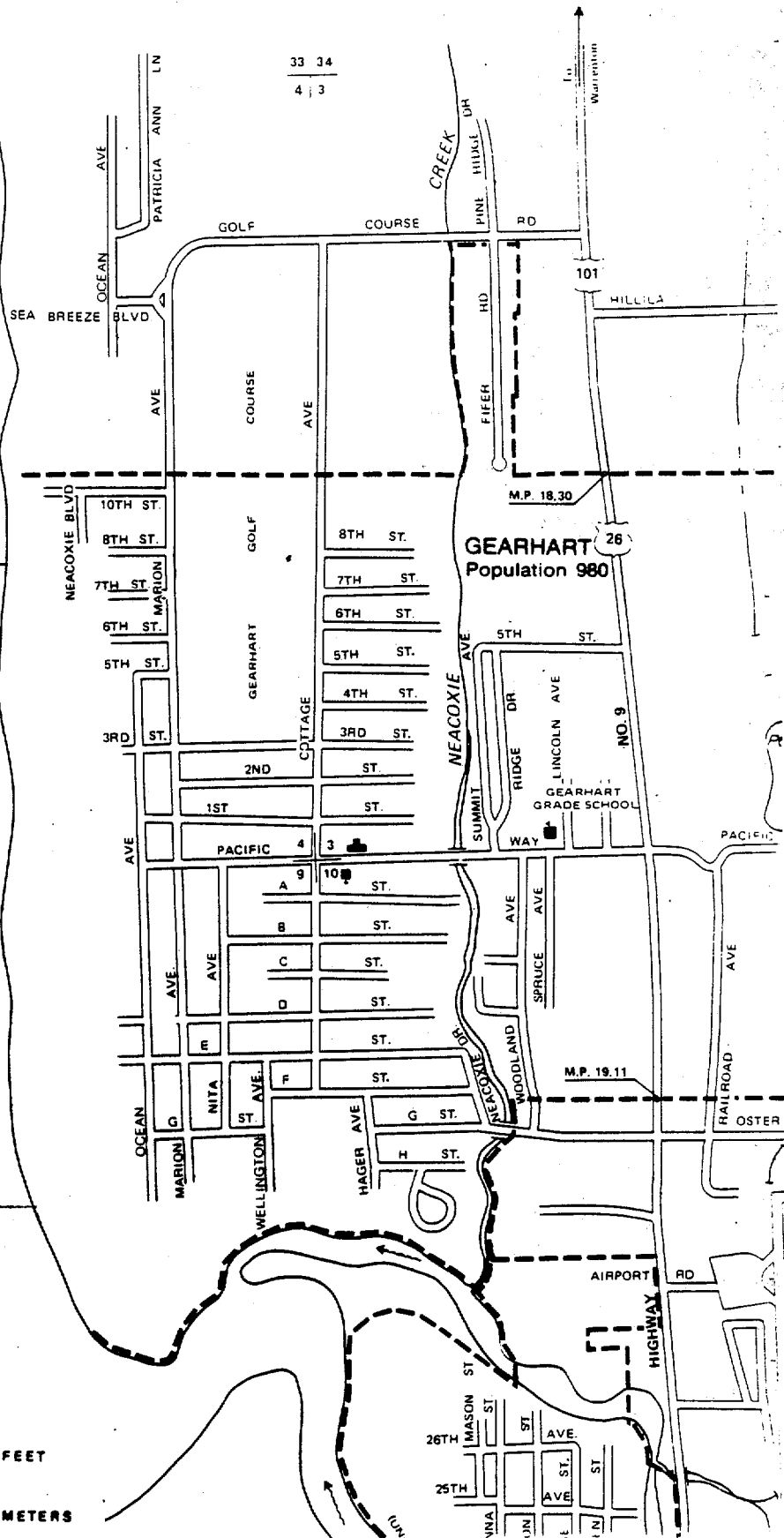
| <u>Subarea Name</u> | <u>Length (feet)</u> | <u>Homes 78/84</u> | <u>BZL DX</u> | <u>Dune Width</u> | <u>Grass Cover</u> | <u>Flood Elev</u> |
|---------------------|--------------------------|------------------------|-------------------|-----------------------|------------------------|-----------------------|
| Gearhart | 10,500 | 58/60 | | | | |
| Highlands | 2650 | 0/0 | na | 650/625 | 95/95 | |
| Gearhart North | 4300 | 42/44 | 550 | 700/750 | 95/95 | 23-29 |
| Hotel Strip | 1450 | 5H/5H | 100 | 300/300 | 30/60 | 26 |
| Gearhart City | 2100 | 16/16 | 240 | 610/590 | 80/85 | |
| Seaside | 10,700 | 127/129 | | | | |
| 12th-19th | 1600 | 23/25 | 100 | 250/300 | 15/30 | 20 |
| Prom-Turnaround | 4200 | 32-7H | 40 | 0/0 | 5/5 | 20 |
| Prom-South | 3400 | 56/56 | 175 | /220 | 80/80 | 20 |
| South Seaside | 1500 | 16/16 | 75 | 0/0 | 0/0 | 20 |
| Pacific City | 8,000 | 64/71 | | | | |
| Kiwanada North | 750 | 0/0 | na | 100/75 | 80/100 | 30 |
| Cape Kiwanada | 1100 | 14/14 | 110 | 120/70 | 15/0 | 30 |
| Undeveloped | 900 | 0/1 | 75 | 50/35 | 50/50 | 30 |
| Kiwanada Shores | 2600 | 18/22 | 60 | 45/50 | 0/0 | 30 |
| Turnaround | 1350 | 12/14 | 150 | 60/40 | 50/15 | 30 |
| South | 1300 | 20/20 | 175 | 125/125 | 10/10 | 30 |
| Neskowin | 11,625 | 70/84 | | | | |
| Neskowin North | 575 | 4/6 | 50 | 100/100 | 40/30 | 19 |
| Breaches | 4850 | 33/35 | 600 | 640/650 | 75/75 | 19 |
| Community | 2800 | 23/24 | 80 | 90/100 | 80/80 | 24 |
| Creek Spit | 750 | 4/4 | 25 | 20/20 | 60/50 | 24 |
| South+ | 2650 | 6/15 | 40 | 50/35 | 70/80 | 19 |
| Bayshore | 10,200 | 45/74 | | | | |
| Bayshore North | 1400 | 17/23 | 30 | 40/40 | 80/80 | 27/28 |
| Beachclub North | 4000 | 18/28 | 45 | 65/75 | 60/90 | 29/31 |
| Beachclub South | 2000 | 7/11 | 15 | 115/115 | 40/65 | 28 |
| Spit | 2800 | 3/12 | 20 | 125/30 | 75/50 | 28 |
| TOTAL | <u>51,025</u> | | | | | |

Highlands

Gearhart
North

Hotel Strip

Gearhart
City



AREA ASSESSMENTS

Gearhart

The Gearhart area includes all of the oceanfront within the city and an adjacent development to the north known as "The Highlands". This is a total of two miles of shoreline north of the Necanicum River mouth.

Overall Assessment

Gearhart has the broadest and most completely vegetated foredunes on the Oregon coast. The foredunes average more than 500 feet in width throughout the area. The width of the foredune is the result of tremendous accretion from sediment input from the Columbia River since the turn of the century. Oceanfront homes built at the turn of the century were close to the ocean beach. Steady accretion has built the dune more than 300 feet oceanward since that time.

Gearhart is also unique in that it is the only community of the five studied where American dunegrass (Elymus mollis) is the dominant grass species. The 1989 site visit showed that European beachgrass (Ammophila arenaria) was present but was largely limited to the top of the seaward edge of the foredune -- the part of the dune receiving the most sand inundation. Areas further back, experiencing little or no sand inundations are almost 100% American dunegrass.

Back areas of the dune (i.e. areas within 100-150 feet of oceanfront homes) show evidence of secondary plant stabilization. Well developed clumps of shorepine and shrubs are apparent within this area.

The view from most oceanfront homes is a broad view of the ocean with only a limited view of the surf zone. The height of the front of the foredune in combination with the width of the foredune block almost any view of the beach itself. In this setting, the broad, relatively flat crest is the major foreground feature for ocean views.

Scientific opinion about the long-term stability of the dunes at Gearhart is divided. There is some evidence that the long episode of accretion of the Clatsop Plains is coming to an end. This is because the amount of sediment coming down the Columbia River has been reduced both by dams and by improved forest practices in the watershed. Monitoring of the shoreline tends to suggest increasing erosion in areas of the plains north of Gearhart, and that this erosion is moving progressively further south. Other scientists have debated this evidence. Further study is needed before this question can be resolved.

The City of Gearhart has adopted strict policies regarding setbacks of new development from the dunes. These policies reflect concerns about hazards as well as protecting views for existing oceanfront homes. Basically, most new development must be set back in line with existing development. Since the shoreline is now essentially fully developed, there is less pressure for new development further seaward.

Past Alterations

Portions of the dune at Gearhart have been graded in the past. The area in front of one condominium development has been graded several times, apparently to maintain ocean views for first floor condominium units. Other condominium developments have also graded, but not as frequently or as extensively. There is also a major vehicle access to the beach in Gearhart which may contribute to dune management problems.

The area has changed very little over the last ten years. The comparison of aerial photographs shows that some areas have accreted slightly while others have eroded slightly. The differences are within the margin of error for interpretation of the photos.

In 1986, the Highlands development was approved. It will result in the construction of some 26 new oceanfront homes. The developer, as well as several property owners, sought and obtained an amendment to Goal 18 which allowed foredune grading for undeveloped areas within urban growth boundaries, the only qualifying area being The Highlands property. They have subsequently expressed an interest in developing a foredune grading plan. As of this date no work on a specific plan for the area has been done.

Subarea Assessment

GEARHART SUBAREA SUMMARY

| <u>Subarea</u> | <u>Length (feet)</u> | <u>Homes 78/84</u> | <u>BZL DX</u> | <u>Dune Width</u> | <u>Grass Cover</u> | <u>Flood Elev</u> |
|----------------|--------------------------|------------------------|-------------------|-----------------------|------------------------|-----------------------|
| Highlands | 2650 | 0/0 | na | 650/625 | 95/95 | |
| Gearhart North | 4300 | 42/44 | 550 | 700/750 | 95/95 | |
| Hotel Strip | 1450 | 5H/5H | 100 | 300/300 | 30/60 | |
| Gearhart City | <u>2100</u> | <u>16/16</u> | 240 | 610/590 | 80/85 | |
| Total | <u>10,500</u> | <u>58/60</u> | | | | |

The Highlands

This property was undeveloped in both 1984 and 1986. The area landward of the line of ocean flooding is eligible for development under Goal 18 and was platted and developed as The Highlands in 1985-87. There were no notable changes in the dune between 1978 and 1984. Construction of the subdivision in 1986 also caused no apparent changes in the foredune.

The Del Rey Beach Wayside is immediately north of the Highlands development. The large parking lot at Del Rey is within 25 feet of the beach zone line, and the foredune in this area is 150 feet wide. Three improved pedestrian accesses and one vehicle access are located at Del Rey.

Between 1986 and 1989, roads, a golf course and several oceanfront homes were built at The Highlands. Homes are set back in line with existing development in the Gearhart North Subarea. An elevated wooden boardwalk has been constructed across the dune providing access to a viewing platform at the seaward edge of the dune for The Highlands homeowners. The boardwalk also provides a convenient way to cross the dune to get to the beach.

Oceanfront homes at The Highlands have modest distant ocean views. The crest of the foredune just landward of the beach in combination with the wide foredune obscure views of the beach and surf zone except for some second story views. Second tier homes have a somewhat more expansive view because they are located on an older foredune ridge which is somewhat higher than the present foredune.

Rough estimates by Wilbur Ternyik of Wave Beachgrass Nursery in Florence are that The Highlands may be eligible to move up to 5 million cubic yards of sand under the provisions of Goal 18. It is doubtful anywhere near this amount of sand would be moved given the cost of simply moving the sand and the difficulty of placing this sand somewhere else in the beach-foredune system (as required by Goal 18) without harming adjacent areas.

Gearhart North

No new development occurred in this area between 1978 and 1984, and only one major dune alteration was apparent. In 1978, a rectangular patch approximately 600 feet long by 300 feet wide was either graded or mowed. The area straddles the zone line and covers an area in front of 5 of the 16 homes in this area. This same rectangle is still apparent in the 1984 photo. The surrounding area does not appear to have been harmed by this activity, whatever it was.

The 1989 site visit disclosed that the beach access at the border between this area and the hotel strip is a popular equestrian access point. The area has also been used, illegally by four wheel drive vehicles and off road vehicles. The foredune in this

subarea is cut by 2 or 3 vehicle trails and some random use was also apparent.

Hotel Strip

This area is the focus of intense recreational activity and is the most altered of the subareas in Gearhart. The major alteration is the vehicle access in approximately the center of this site, which is a partial breach in the dune; a long, paved and gravelled ramp from the street to the beach. The beach to the north is open to vehicle access, and this is a major access to the beach (the other major access being Del Rey Beach). The beach to the south is closed to vehicles. The vehicle access creates a long, low depression in the dune, although it does rise up as it goes landward.

The 1989 site visit showed evidence that the vehicle access had recently been graded. Graded sand was placed or windblown to the north. Dunes just north of the access showed evidence of recent accretion (i.e., grass burial, higher dunes than adjacent areas, lust grass, etc.). The access is also noticeably wider at the beach end than at the landward end. It widens from 30 to 200 feet. Most of this appears to be the result of grading -- apparently to keep the seaward end of the access open -- but has also encouraged vehicle use throughout the opening. This prevents the dune from rebuilding. Future management of the access should consider placement of sand fences or other techniques to narrow this opening consistent with providing safe vehicle and pedestrian access to the beach.

There have also been two major alterations of the dunes associated with hotel/motel/condominium development in this area. Complexes are scattered at different distances from the beach zone line, ranging from 20 to 170 feet landward of the zone line. This complicates effective management of the dune. Also, dunes oceanward of at least two of the complexes have been periodically graded.

It appears that in 1978, the area in front of all of the complexes was graded to some degree. For four of the five complexes, grading was limited to portions of the dune within 75 to 125 feet of the units; however, the area oceanward of one of the complexes was completely graded. The 1984 photos show that the four partially graded areas had largely recovered. They all had good beachgrass cover. The 1984 photos also show that the southern complex was still graded.

The major reason the southern complex was graded again appears to be the design of the units. The first floor is at or below grade level. Almost constant grading is necessary to maintain a view from these units. By contrast, the other motels have elevated their first floors slightly to allow a view over the dune without extensive grading.

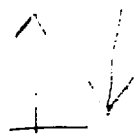
There are footpaths crisscrossing the dunes in this area, but they do not appear to have created any major erosion problems.

Gearhart City

Comparison of aerial photography shows very little change in this foredune between 1978 and 1984. The dune is more than 700 feet wide and is well vegetated. Pathways across the dune are evident but have not resulted in any major erosion.

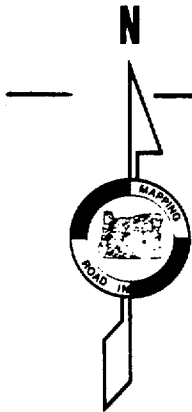
Management Needs

The Gearhart foredune is in excellent condition. Little if any additional management appears necessary to improve the flood protection benefits provided by the dune. Restrictions on grading in the hotel strip area are needed. It may not be possible to allow grading in front of the one hotel complex with low elevation first-floor units; however, this will require determination of elevation.



OCEAN

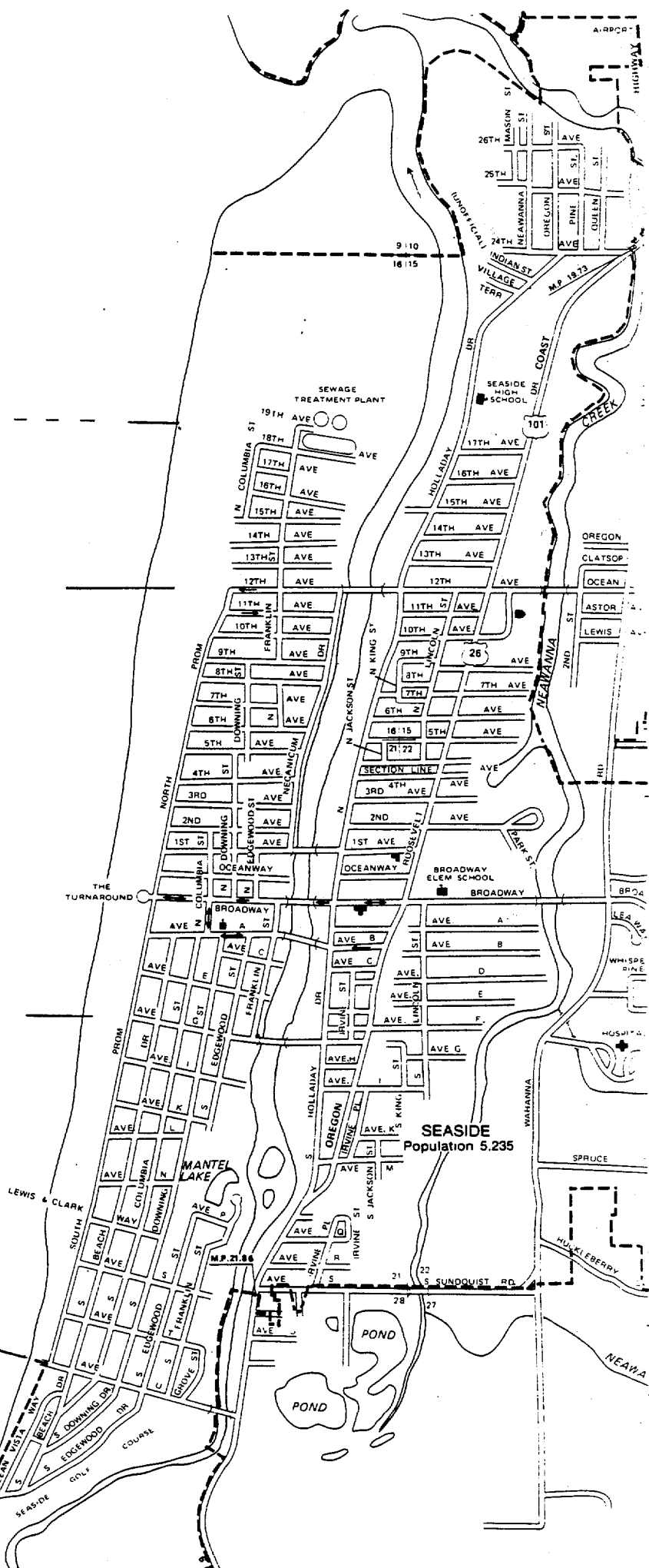
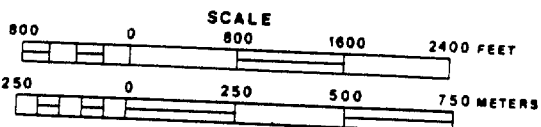
12th - 19th



Prom -
Turnaround

Prom -
South

South
seaside



SUNSET BEACH
TILLAMOOK HEAD COVE RD

Seaside

Overall Assessment

The oceanfront at Seaside is one of the most diverse and most altered on the Oregon coast. The shore is alternately wide dunes, a wide beach, more wide dunes, a narrow beach and a cobble beach, finally tapering to no beach at all. The most noticeable feature, though, is the 8000 foot long promenade, called the Prom, and the 400- to 500-foot-wide beach in front of it. (The Prom was completed in November 1920 at a cost of \$200,000.) The broad, flat beach is the city's trademark attraction, and distinguishes Seaside from other oceanfront cities in Oregon. The long-term effect of grading is not known. It has apparently been a historic practice since the Prom was built.

The 1989 visit confirmed that the beaches and dunes at Seaside are continuing to change. Hummocks and partially vegetated low areas north and south of the Prom are accreting. The result is that a new foredune is emerging seaward of most of the Prom. This may not be a new occurrence given the city's historic practice of grading much of this area. Nonetheless, the emergent dune is more apparent now than it has been in the last ten to fifteen years.

Dune grading has been proposed by the property owners in the area between 12th and 19th Streets. Property owners in this area actively sought an amendment to allow grading in 1984. The city worked on a plan through 1985, but abandoned it when much of the northern part of this area was eroded away. (Erosion appears to have been the result of migration of the Necanicum River outlet to the south, perhaps a result of the 1982-83 El Niño.)

Subarea Assessments

SEASIDE SUBAREA SUMMARY

| <u>Subarea</u> | <u>Length (feet)</u> | <u>Homes 78/84</u> | <u>BZL DX</u> | <u>Dune Width</u> | <u>Grass Cover</u> | <u>Flood Elev</u> |
|-----------------|--------------------------|------------------------|-------------------|-----------------------|------------------------|-----------------------|
| 12th-19th | 1600 | 23/25 | 100 | 250/300 | 15/30 | 20 |
| Prom-Turnaround | 4200 | 32-7H | 40 | 0/0 | 5/5 | 20 |
| Prom-South | 3400 | 56/56 | 175 | /220 | 80/80 | 20 |
| South Seaside | <u>1500</u> | <u>16/16</u> | 75 | 0/0 | 0/0 | 20 |
| Total | 10,700 | 127/129 | | | | |

12th to 19th Streets

As noted above, this subarea has been proposed as a site for a foredune grading plan. The demand for the plan is the result of substantial growth in the foredune at this location over the last ten to fifteen years. 1978 aerial photographs show dunes in this area, but the dunes are largely emergent in character. 1984 photos show a dramatic increase in beachgrass cover -- the average coverage has doubled from 15% in 1978 to 30% in 1984. Property owner complaints about the dunes echo this history of dune growth. The Department has received several letters chronicling the changes in the area, from a relatively flat or hummocky beach 15 to 20 years ago, to an ever-growing dune since. These observations are consistent with the location of the beach zone line. The zone line varies from 65 to 175 feet in front of the oceanfront homes. The dune averages almost 300 feet in width seaward of the zone line.

During review of Seaside's comprehensive plan (1981-83), the Department reviewed a proposed exception for grading in this area. The initial proposal was for grading the entire dune. This was not approved. A modified exception allowed for sand removal within 35 feet west of oceanfront property lines. No alteration of other dune areas or dune vegetation could occur as part of this grading. This offsets the problem of windblown sand building up against fences and in the yards of homes in this area. Grading of this "trough" area between the homes and the beach zone line is apparent in the 1984 aerial photos.

Much of the accretion in this area appears to be the result of grading the area in front of the Prom. Grading in front of the Prom creates a vast expanse of sand open to wind scour and movement. The area between 12th and 19th Streets, and particularly the area in front of the homes, is at the receiving end of the beach when predominantly southwest winds move sand across the beach during the winter.

The crest of the dune at Seaside varies in height. According to the draft dune management plan prepared in 1985, there were several places where the dune crest is 25 feet msl. However, most of the dune crest appears to be slightly below this elevation. The flood elevation is 20 feet, which means that, at most, 1 foot of sand could be graded off the highest portion of the dune. In short, unless the foredune has grown in height since 1985, not much grading would likely be allowed.

The 1989 visit showed several changes in the dune in this area from 1984. In 1985, the dune at the North end of the subarea experienced severe erosion when the mouth of the Necanicum River shifted south and ran parallel to shore. High tides and a relatively mild ocean storm led to active erosion of the dune within 30-50 feet of the northernmost homes. Several lots were riprapped to prevent damage to homes. By 1989, most of the area was well into the process of natural repair. However, evidence

of erosion is still apparent in front of the third to tenth houses from the north. In this area (approximately 500 feet) a cusp (crescent shaped embayment) from the erosion event is still apparent. It has partially filled with driftwood and the erosion scarp has largely healed. Sand has filled part of the area and beachgrass covers most of the embayment area. Both European beachgrass and American dunegrass are present.

The 1989 visit also found evidence of illegal grading in this subarea just south of the erosion cusp discussed above. The entire dune in front of the fourteenth house from the north has little or no vegetation on it. There is a gap at the seaward edge of the dune that provides a narrow view of the ocean beach and surf. This appears to be the result of a combination of grading and the application of some sort of herbicide. Dunes on either side of the graded lot are noticeably higher and are growing as a result of the absence of vegetation on the front part of the foredune in this area.

With the exception of the graded and eroded areas mentioned above this subarea is well-vegetated. The crest and backslope have 80-95% beachgrass cover and there is a noticeable number of secondary plants including dandelions. However, the dune within 30-75 feet of most houses in this area has been graded per the approved plan exception.

The highest part of the foredune in this subarea is Near 12th Avenue. The wide sandy beach south of 12th has provided an ample supply of sand which, fed by Southwest winds, has caused this part of the dune to build continually higher. The 1989 visit confirmed that this part of the dune was still receiving new sand accretion.

Prom Turnaround

This subarea includes the entire area seaward of the Prom from the Turnaround to its northern terminus at the 12th Street parking lot. The area appears to have changed somewhat between 1978 and 1989. Early photos suggest that the dune was largely scattered hummocks with clumps of dense beachgrass cover. Also it appears that the dune in 1978 was relatively flat.

The 1989 site visit draws a much different picture of the beach in this area. Open sand is limited to two areas: a 200 to 300 foot stretch north of the Prom and the area between 5th and 7th Avenues. The remainder of this subarea is characterized as emergent foredune in different states of development.

Much of the emergent foredune is still hummocky in character. Well vegetated mounds are apparent. Even so, intervening areas, while less vegetated have good cover (up to 50-60%) and have created a relatively high (16-18 foot) wide (100 to 160 foot) dune ridge. It is less noticeable than other dunes in the area because it is generally at or below the level of the Prom -- 20 feet msl.

The two other major features in this area are the Promenade and the beach. The Prom is a wide, paved walkway and seawall above the beach. The top of the Prom is approximately 20 feet above sea level, or roughly at the same elevation as a 100-year ocean flood event. The dry sand beach (i.e., above ordinary high tide) is correspondingly broad and flat, stretching seaward 400 to 500 feet. The beach in front of the Prom is a major recreational attraction.

Historically, windblown sand which has accumulated in front of the Prom has been hauled away. Removal has been requested by the city to prevent sand from overtopping the Prom and covering the Prom and adjacent oceanfront properties. Sand has been removed by private contractors, at no charge to the city, for use as construction fill.

The practice of grading was reviewed during the acknowledgment review of the City of Seaside's comprehensive plan. The city's plan includes a Goal exception which provides for limited, periodic removal of sand accumulations in front of the Prom (see Seaside Comprehensive Plan, Ordinance 83-11, June 27, 1983, pages 42, 76-77). The practice is limited to removal of sand "which constitutes a hazard or maintenance problem to the Prom or property upland from the Prom. Removal of sand occurs on an irregular basis, whenever sand buildup necessitates action. Contractors are required to remove sand evenly, leaving no holes or cliffs, and are required to grade the area on a smooth contour to the beach to maintain the recreational value of the area" (Seaside Plan, page 77). Adoption of a dune management plan in compliance with Goal 18 would require the city to modify this practice. Sand could continue to be moved away from the Prom, but would have to be retained within the beach-foredune system (see Goal 18 Implementation Requirement 6(f)).

The emergence of a foredune in this area may complicate the development of a dune management plan by the city. The city's 1989 draft management plan proposes that much of the emergent dune area be eligible for more extensive grading than is presently permitted in the comprehensive plan. This would likely violate Goal 18's limitation on dune grading. Resolution of this issue will require further work between the Department and the city.

Prom South

This segment includes the southern 3400 feet of the Prom, starting just south of the Turnaround. In contrast to the relatively flat beach to the north, there is a well-established dune just seaward of the Prom throughout the area. The dune appears to have been there for more than twenty years, since the beach zone line in this area is 100 to 170 feet seaward of the Prom. (By contrast, the beach zone line is along the Prom for the subarea to the north.)

The dune is narrowest at the north end and gets progressively wider and better vegetated further south. The dune ranges from 125 feet to 250 feet in width (1984).

There does not appear to have been any major alterations of the dune in this area. The only exception is at the very northern end of the area where it appears that the dune may have been graded at one time.

Although the city's policy on sand removal technically applies to the entire area in front of the Prom, this area is generally not eligible for grading. As noted above, grading is only allowed when sand accumulation "constitutes a hazard or maintenance problem to the Prom or property upland from the Prom." This is clearly aimed at the unvegetated accumulations of sand immediately against the Prom to the north. In this area, the dunes effectively stop windblown sand from accumulating against the Prom or other adjacent properties. Even if accumulations did occur, grading of a narrow area just in front of the Prom (i.e., 30 to 40 feet), as was done at 12th-19th Streets, could solve this problem.

The 1989 site visit showed that an emergent foredune was developing between A Street and Avenue G. The dune is much like the one emerging north of the Prom, in that the dune was not readily apparent in 1978 and 1984 aerial photos. At those earlier dates the area appeared to be more a collection of dune hummocks with scattered beachgrass cover. The 1989 visit showed the area to be much more dune-like in character. From A Street south the dune is low (approximately 14 to 16 feet high) and 120 to 150 wide (i.e. the front of the dune is 120 to 150 feet seaward of the west side of the Prom. Vegetative cover varies from 40-60% and is a mixture of American and European beachgrass hummocks.

There was a noticeable change in the character of the dune at Avenue G. The dune was higher (averaging around 18 feet), somewhat wider (approximately 180 feet) and better vegetated (about 80-85% cover). The dune is also less hummocky than the dunes between Avenues A and G. Between Avenues G and H, the dune is almost even with the Prom.

The area south of Avenue H shows up in the 1978 and 1984 aerial photos as a well-established foredune. The 1989 site visit disclosed that the dune here was higher and more stable than the emerging dune area to the north. The dune south of Avenue H was consistently as high as the Prom -- at or above 20 feet msl. In addition, secondary dune plants were well developed in the back half of the dune. Shorepine and scotchbroom were apparent in decreasing density in this area. Salal had developed just west of the Prom. Throughout this back half of the foredune European beachgrass was largely crowded out and coast strawberry and other grasses were taking over.

Together these observations about the condition of the dune suggest that the area from Avenue A to Avenue G is evolving from a hummocky beach to a more classical foredune ridge. This is quite similar to what is happening north of the Turnaround. Given the limited vertical detail in the available aerial photographs it is difficult to determine whether this growth is relatively recent or had occurred and was simply not visible in the earlier photos. A clear answer to this question will require further study and could perhaps be done through a more sophisticated interpretation of the available photography.

Seaside South

This subarea extends from the southern end of the Prom to the end of the sandy beach at Seaside. No foredune was apparent in this area. The foredune in front of the Prom to the north, ends abruptly at the end of the Prom. Just south of that point, (at the northern end of this subarea) a hotel is located parallel with the Prom and sticks out 125 feet seaward of the west edge of the Prom. The remainder of the shoreline in this area is covered with drift logs, although concentrations vary from lot to lot.

This subarea is a transition between the relatively wide dune to the north and the rocky cobble beach to the south at the north end of Tillamook Head. The major difference between this area and the South Prom area appears to be the placement of structures. On the average, structures in this area are within 75 feet landward of the beach zone line. Just to the north, in the South Prom area, homes are 175 feet back from the zone line.

The area appears to be protected from southwest waves by the headland.

The major alteration in this area is the hotel and oceanfront homes located very close to the beach zone line. This factor, together with the sheltering effect of Tillamook Head, appears to have prevented the establishment of a foredune at this location.

Management Needs

The dunes at Seaside are diverse and will require different management measures. The major alteration will continue to be grading sand in front of the Prom.

The city and the Department of Parks and Recreation (which regulates grading) should evaluate the effects of grading on accretion in the area north of 12th Street. The rather dramatic accretion of dunes north of 12th Street over the last ten to twenty years suggests grading may be a major problem. One solution might be the placement of sand fences perpendicular to the beach near 12th Street. At a minimum, this should be attempted on an experimental basis to determine how much sand is moving up the beach. If the experiments bear out, timely placement of sand fences might be an effective means of capturing

sand before it accumulates in front of the homes or on the dunes north of 12th Street.

The 1989 site visit confirmed that much of the Prom previously thought to be fronted by a hummocky beach appears instead to be fronted by a distinct but emergent foredune. The effects of this change need to be more fully evaluated in the city's proposed dune management plan. Existence of the dune may restrict the city's ability to do much grading beyond what their current comprehensive plan policies allow.

Another major issue relative to grading in front of the Prom is the placement of graded sand. Currently, sand accumulations in front of the Prom are hauled off the beach altogether. Over time this practice will reduce the amount of sand on the beach and could result in shoreline erosion. Consequently, the city and Parks should consider the alternative of spreading graded sand back onto the beach. This would alleviate the accumulation problem without potentially causing shoreline erosion.

NATIONAL ISLANDS WILDLIFE REFUGE

Haystack Rock

Cape Kiwanda

Kiwanda North

Cape Kiwanda

Undeveloped

Kiwanda Shores

Turnaround

South

Kiwanda Beach

NESTUCCA SPIT STATE PARK

North Spit

Web County Park

Trailer Park

Sewage Treatment Plant

Woods

Woods Co Park

Pacific City

Fisher Landing

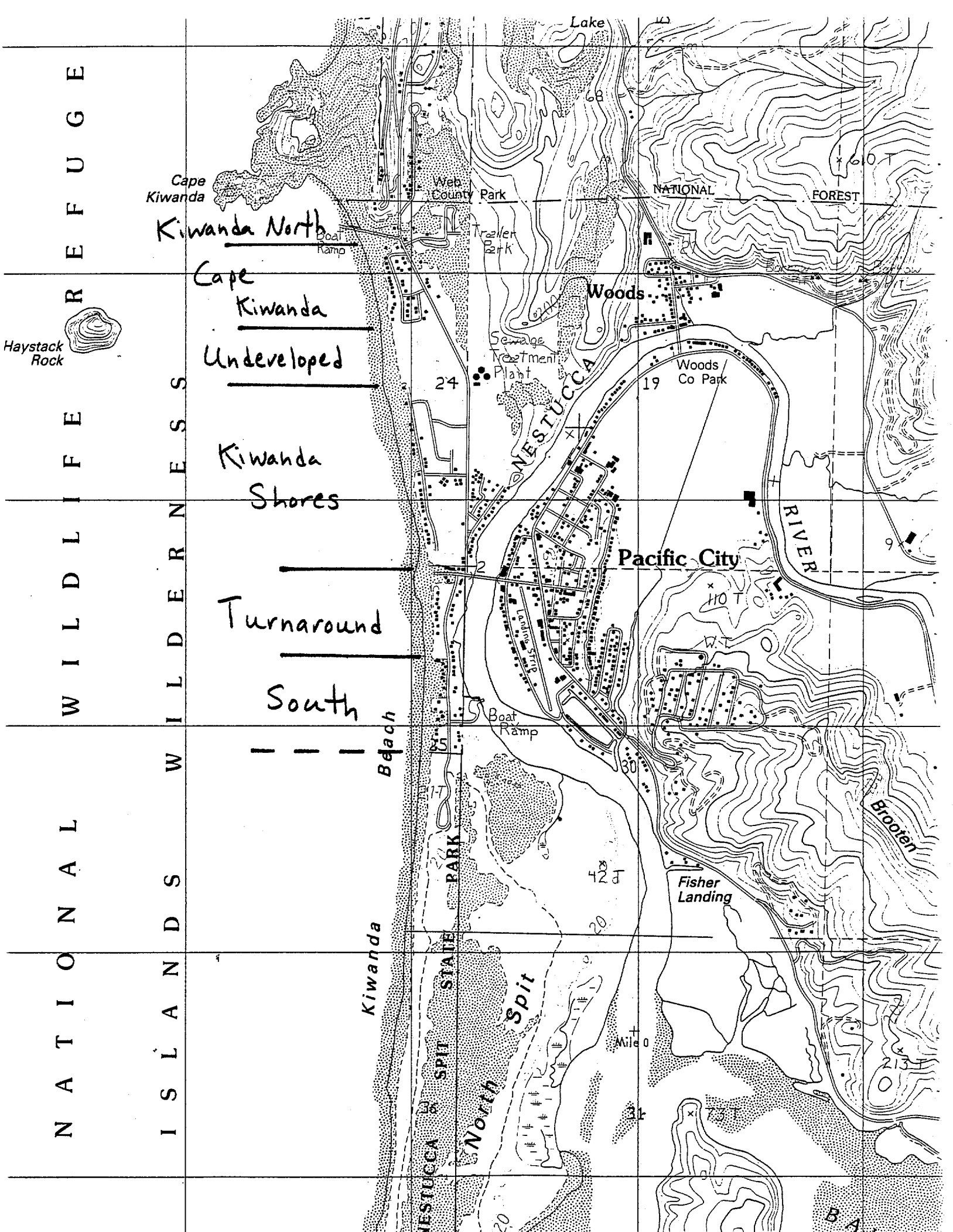
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NATIONAL FOREST

NATIONAL FOREST

RIVER

Brook



Pacific City

Overall Assessment

Pacific City is perhaps the most altered foredune along the Oregon coast. Grading has completely obliterated beachgrass (or prevented its establishment over almost 75% of the area). The result is that most of the Pacific City foredune is open sand. This is both a nuisance and a hazard to oceanfront homes. Many property owners are in an almost constant battle to dig themselves out from under accumulations of sand. While the precise cause of the problem is difficult to determine, two factors have contributed to the problem. The first is the location of oceanfront homes. Homes at Pacific City, are on the average, closer to the beach zone line than in most other areas. Second, grading sand to maintain structures, prevent inundation, restore views, and provide access has been a historic practice on the Pacific City shoreline.

Subarea Assessments

PACIFIC CITY SUBAREA SUMMARY

| <u>Subarea</u> | <u>Length (feet)</u> | <u>Homes 78/84</u> | <u>BZL DX</u> | <u>Dune Width</u> | <u>Grass Cover</u> | <u>Flood Elev</u> |
|----------------|--------------------------|------------------------|-------------------|-----------------------|------------------------|-----------------------|
| Kiwanda North | 750 | 0/0 | na | 100/75 | 80/100 | 30 |
| Cape Kiwanda | 1100 | 14/14 | 110 | 120/70 | 15/0 | 30 |
| Undeveloped | 900 | 0/1 | 75 | 50/35 | 50/50 | 30 |
| Kiwanda Shores | 2600 | 18/22 | 60 | 45/50 | 0/0 | 30 |
| Turnaround | 1350 | 12/14 | 150 | 60/40 | 50/15 | 30 |
| South | <u>1300</u> | <u>20/20</u> | 175 | 125/125 | 10/10 | 30 |
| Total | <u>8,000</u> | <u>64/71</u> | | | | |

Kiwanda North

This subarea includes two properties: an undeveloped private parcel just south of Cape Kiwanda State Park and the dory boat launch and county parking lot south of that. The two sites are somewhat different. The private site is zoned for fairly intense residential development. The site appears to have been graded and stabilized several years ago, but was not altered between 1978 and 1984. Some erosion is apparent at the site. In 1978, the foredune north of the county parking lot extended about 25 feet west of the beach zone line. By 1984, most of the dunes west of the zone line had eroded back to the beach zone line.

By contrast, the dune in front of the county parking lot has been altered. In 1978, the area had about 35% beachgrass cover. In

1986, little or no beachgrass was apparent. Grading may have been done to open up views from the restaurant that is located just upland of the parking lot. Also, in the 1984 photos, loose sand was apparent on the parking lot and inland areas.

In summary, the north area is in good shape while the south area needs help. The main issue for the private property to the north is the establishment of a setback for new development. Since this site and the adjacent properties are undeveloped, it is unclear exactly where the setback line would be for new development. Where there is no development on adjoining lots, the county determines the setback based on the setback of the four closest oceanfront buildings. In this case, the restaurant and the three southernmost homes would be counted; they are an average of about 65 feet landward of the beach zone line.

The parking lot needs to be stabilized. The dune here appears to have been altered by both grading and unrestricted public access across the dune. This has resulted in accumulations of windblown sand in the parking lots. The dune in front of the parking lot should be planted and fenced. Both of these measures should be carefully designed to provide adequate access both for dory boat launching and pedestrian access.

Cape Kiwanda

This is an older residential subdivision just south of the dory boat launching area. Most of the homes here are single-story beach cabins built relatively low in relation to the dune. Grading appears to have been done both to maintain ocean views and to remove accumulations from the houses.

Most of the dune appears to have been either graded or eroded between 1978 and 1984. In 1978, the dune averaged about 110 feet wide. At this time, the forward edge of the dune was well vegetated but there was little or no vegetation on the broad, flat crest. By 1984, the dune had eroded an average of 20-40 feet landward of the beach zone line, and little or no beachgrass was apparent.

Beachgrass planting on the forward slope appears to be the major management measure needed here. This should prevent accumulations of sand against the oceanfront homes. However, since many of the homes are relatively low in elevation, achieving the four-foot minimum flood elevation may not restore ocean views.

Undeveloped Area

This subarea includes 900 feet of undeveloped shoreline between Cape Kiwanda to the north and Kiwanda Shores to the south. Between 1978 and 1984, one house was built at the back edge of the foredune.

The foredune in this stretch is less altered and somewhat more vegetated than the developed areas to the north and south. This indicates that alterations associated with development have been the major problem in Pacific City. Nonetheless, the foredune in this area is quite narrow: it was approximately 50 feet wide in 1978 and only 35 feet wide in 1984.

A comparison of the 1978 and 1984 photos confirmed that a small amount of erosion (10 to 15 feet) had occurred in this area. Also, there was a slight reduction of beachgrass cover, which appeared to be the result of off-road vehicle use in the area. Pathways apparent in the 1978 photo were much wider in the 1984 photo.

The major management issue in this area will be the location of new oceanfront homes. Using the county's existing setback formula will result in houses being placed very close to the forward edge of the foredune. This is because existing homes to the north and south are also close to the edge. The setback in this area should be reconsidered, especially in light of FEMA's requirements for mapping velocity flood areas.

Kiwanda Shores

The Kiwanda Shores subdivision is the most altered area within the Pacific City area. The foredune in this area is tall and steep and is fronted by a very short beach. The developed area is somewhat further seaward than any other development on this stretch of coastline. This appears to have been the result of a conscious effort to plat lots and build homes as close to the edge as possible. Homes are an average of 60 feet landward of the beach zone line, and the dune is only 50 feet wide.

The dune, such as it is, has been extensively altered. In 1978, about 1700 feet of the shoreline was riprapped in response to ongoing erosion. Riprap was typically placed 25 feet in front of the homes and appears to extend about 20 feet seaward from that point. By 1984, the riprapped areas were covered with sand. Sand inundation was also apparent in the entire subarea, around houses, and on and across the road. In addition, large stockpiles of graded sand were visible close to the Three Capes Highway.

Property owners confirmed that the area has experienced continuing inundation by windblown sand. Most property owners have to remove sand once or twice a year, to keep sand from damaging structures and to simply make the structures accessible. Sand piling against foundations, walls and decks damages structures, and windblown sand etches glass. Some property owners report spending several hundred dollars a year on maintenance.

Grading itself may be contributing to the accretion problem. Graded sand is typically pushed back seaward and left

unstabilized, where it is eventually blown back toward the oceanfront homes.

Continued grading to maintain oceanfront homes was authorized through a Goal 18 exception included in Tillamook County's comprehensive plan. This exception allows limited removal of sand which is actually accumulating against oceanfront structures. In 1987, several property owners were issued permits to remove sand from around their structures. However, several property owners graded more than that permitted by the county's policy. As a result the county now works more closely with property owners to ensure that grading meets permit requirements.

Some long-term, areawide solution to the problem of sand accretion is needed. The ongoing practice of grading and sand removal has not resolved the underlying accretion problem. The Department has encouraged the county to develop a dune grading plan for this area. Initial efforts are underway. The county is also regulating grading.

Turnaround

This subarea includes the county parking lot and beach access and the area to the south, which includes a total of 14 homes (1984). The foredune in this area is narrow (60 feet in 1978 and 40 feet in 1984), but development is noticeably further landward than in Kiwanda Shores (averaging 150 feet landward here versus only 60 feet at Kiwanda Shores.)

The major alteration in the area is the county parking lot and the beach access at that location. The parking lot is effectively a 175 to 200 foot wide breach in the foredune. The area has historically been lowered. In years past, the parking lot was the site of a dance hall. More recently, the county has kept the parking lot graded to provide for vehicle access to the beach and parking. The result is that the parking lot is the lowest and narrowest portion of the entire Nestucca River Spit--the spit measured from the beach zone line to the river is only 500 to 700 feet wide. The velocity flood zone at the parking lot extends inland to within 200 feet of the Nestucca. A major flood event at this location might easily breach the spit and could conceivably cut off the southern portion of the spit.

Between 1978 and 1984, the amount of beachgrass in front of homes in this area was substantially reduced--from an average of 50% cover in 1978 to only about 15% cover in 1984. This appears to have been largely the result of grading individual lots. For example, two vacant lots were cleared completely during this time.

Building up a foredune at the county parking lot should be a major priority for dune management in this area. Needs for beach access, parking and vehicle access should be integrated into this plan. Since there are currently no structures in the parking lot

area, it should be possible to accommodate these uses and provide for an adequate dune. Part of this plan should encourage property owners to the south to plant beachgrass in front of their homes.

Homes to the south could be a borderline area. Further reduction in beachgrass could make this area into another sandbox, like Kiwanda Shores.

South Pacific City

The foredune in this area is the broadest in all of Pacific City. The dune averages 125 feet in width, and homes are an average of 175 feet landward of the beach zone line. This corresponds with the age of most of the homes, built in the 1950's and 1960's when the beach was apparently somewhat flatter and further inland. Like the Cape Kiwanda subarea, the homes here are typically small, single-story beach houses, built very low to the ground. Grading to maintain views has resulted in a broad, flat and largely unvegetated dune throughout the area. Notably, though, some lots have not been graded and beachgrass has created island dunes that stick up somewhat higher than surrounding lots. In a couple of cases the difference between adjacent lots is dramatic. In one case, a newer home's foundation is at the same elevation as an adjacent home's roof. The lower home's roof is all that is visible, since accumulated sand has buried the rest of the house.

The extensive grading in this subarea is the only major alteration apparent. The grading has created a broad, flat area that is open to wind scour. This in turn has led to deposition of sand on the area to the north. (The house which is buried up to its roof seems to be the chief victim of this situation.) The management solution is to plant beachgrass on the forward portion of the dune. Establishing a dune which is four feet above the 100-year flood elevation may result in some loss of view from these homes. More detailed information on the height of the dune is needed to determine the extent of this effect.

Management Needs

No area on the Oregon coast could benefit more from dune management than Pacific City. Establishing beachgrass should dramatically reduce sand accretion problems and the attendant maintenance costs throughout the area. The wider foredune will also improve flood protection. And, with the exception of the two older areas (Cape Kiwanda and Pacific City South), planting beachgrass should stabilize a dune which is low enough to maintain ocean views from oceanfront homes.

In the interim, the county needs to continue to work with property owners to find effective ways of dealing with sand accretion. The exception approved as part of the county's comprehensive plan allows removal of sand that is inundating oceanfront homes. This practice needs to be carefully monitored

to ensure that placement of graded sand does not breach the dune or become a maintenance problem for neighboring lots.

Tillamook County has a key role to play in improving the condition of the foredune in Pacific City. Two county parking lots/beach accesses are also major breaches in the Pacific City foredune. Building up these areas is an important management need in its own right and could also be used as a demonstration project for surrounding properties. Beach access, including vehicle and dory boat access, can and should be factored into stabilization projects in these areas.

Neskowin

Overall Assessment

Neskowin's foredunes have been subject to different development pressures. With the exception of the "Breaches" subarea, oceanfront homes have been located on or just at the back of the foredune, close to both the beach zone line and the front of the dune. In the Breaches subarea, which is about 40% of the Neskowin shoreline, development is set back 600+ feet from a foredune characterized by a series of breaches. The conditions and the management needs of each of these areas varies almost as much as the dune width.

Subarea Assessments

NESKOWIN SUBAREA SUMMARY

| <u>Subarea</u> | <u>Length (feet)</u> | <u>Homes 78/84</u> | <u>BZL DX</u> | <u>Dune Width</u> | <u>Grass Cover</u> | <u>Flood Elev</u> |
|----------------|--------------------------|------------------------|-------------------|-----------------------|------------------------|-----------------------|
| Neskowin North | 575 | 4/6 | 50 | 100/100 | 40/30 | 19 |
| Breaches | 4850 | 33/35 | 600 | 640/650 | 75/75 | 19 |
| Community | 2800 | 23/24 | 80 | 90/100 | 80/80 | 24 |
| Creek Spit | 750 | 4/4 | 25 | 20/20 | 60/50 | 24 |
| South+ | <u>2650</u> | <u>6/15</u> | 40 | 50/35 | 70/80 | 19 |
| TOTAL | <u>11,625</u> | <u>70/84</u> | | | | |

Neskowin North

This subarea includes the Neskowin North subdivision at the northern limit of the Neskowin community. The subdivision itself is the principal factor which distinguishes this area from the Breaches subarea to the south. The Neskowin North subdivision is relatively recent--approved in 1971. The subdivision is platted on the front part of the foredune, with homes just 50 feet behind the beach zone line and a dune that averages only 100 feet in width. By contrast, in the Breaches area, homes are 600 feet landward of the zone line and the dune extends inland some 650 feet on the average.

The dune at Neskowin North has also been modified as a result of development there. Construction of homes usually involved grading most of the beachgrass off of the lot. Also, several of the homes have been riprapped to prevent ocean flooding.

The 1989 site visit disclosed that the foredune appears to be accreting fairly rapidly. With the exception of the northernmost

124° 00' W
45° 07' 30" N
422000m E
423
424

4997000m N

Neskowin North

24

Kiwanda Beach

The Breaches

Neskowin Crest

Butte

Neskowin Community

Neskowin

Golf Course

25

Creek Spit

NESKOWIN BEACH STATE WAYSIDE

Proposal Rock

Neskowin

Golf Course

4996

4995

4994

Neskowin South

Quarries

36

Borrow Pit

BM 32.2

Neskowin

OCEAN

4993

NATIONAL FOREST

BOUNDARY

OCEAN

lot, no riprap is apparent in front of oceanfront homes. On most lots riprap has been covered by sand and beachgrass cover is becoming well established. That are a couple of notable exceptions to this pattern. There is little vegetation on the foreslope of the northernmost three lots. As noted above, riprap is still apparent at the house furthest north. In addition, the dune in front of the third house has been graded to maintain an ocean view.

The Breaches

As the name indicates, there are several breaches in this subarea. The five breaches are wide, low openings which separate/bisect a high, relatively well-vegetated foredune. Altogether, the breaches cover 15-20% of this subarea. The remaining 80-85% is the relatively wide foredune. The area appears to be fairly stable, with the toe of the foredune typically 50 to 75 feet seaward of the beach zone line.

Homes in this subarea are located in a line of older, stabilized dunes some 500 to 600 feet landward from the toe of the dune. This older dune is at a relatively low elevation (approximately 15-20 feet) so most homes do not have beach or surf views. Most are two story homes which have a limited ocean view. As at Gearhart, the combination of a wide dune with a relatively high crest tends to obscure the views from oceanfront homes.

The breaches are typically fluted or funnel-shaped, averaging about 400 feet in width at the beach zone line and narrowing to 50 to 100 feet in width in the back area. Drift logs are visible at the landward extreme of each breach, confirming the fact that these areas are cut to a very low elevation.

The breaches themselves are the major alteration in this subarea. At least two of the breaches show clear signs of having been graded in the recent past. The continued absence of beachgrass is atypical. European beachgrass, left to its own devices, is usually quite effective in establishing a uniform dune. The breaches provide nicely aligned view corridors for specific homes at the back of each breach.

The 1989 visit showed that the oceanward end of each of the breaches is filling in. Basically, the seaward ends of the funnel are growing higher and closer together as windblown sand accumulates and is stabilized by beachgrass. Growth was most noticeable at the northern edge of each embayment where grass was lush and vibrant and there were recent accumulations of windblown sand. The effect is also noticeable, but less pronounced on the southern side of the funnel mouths. Rebuilding of the breaches is most pronounced in the seaward 100 feet of each breach. This is where the breach is widest and most exposed to wind. Left alone, it appears that the breaches will continue to heal themselves. However, it's unclear whether this will completely rebuild an even foredune ridge.

Neskowin Community

As the name implies, this subarea is the historic hub of development in Neskowin. Like the Neskowin North subarea, development here is relatively close to the beach zone line (averaging about 80 feet landward) and the foredune in front of oceanfront development is relatively narrow (averaging about 100 feet in width). Two hotel or condominium complexes in the center of the subarea have been built further oceanward than other development. Both are fronted by dunes that average only about 60 to 70 feet in width. By comparison, older oceanfront homes on other lots are set back 100 feet or more.

Other than this slightly discontinuous line of development, there are few major alterations in this subarea. The most notable is a wooden bulkhead in front of the Pacific Sands hotel near the center of the subarea. Grading in front of one of the hotel/condo complexes is apparent in the 1984 photos, but by 1986 the area had 100% vegetative cover. Other lots in the vicinity graded in 1984 had not recovered.

The 1989 site visit disclosed that this subarea as well as the Neskowin Spit subarea to the north had experienced some erosion since 1984. This would be consistent with observations about the longer term effects of El Niño. These observations are that the southern end of pocket beaches tend to erode, while areas further north tend to gain sand. (Note that there has been some accretion at the Breaches subarea to the north.)

The result of the recent erosion episode is that there is a four to eight foot erosion scarp in front of most of the properties in this subarea. (Erosion is most pronounced at the south end of this area and tapers off to the north.) However, natural healing is also evident. Windblown sand is accumulating at the toe of the dune in most of the eroded areas.

The Breakers Condominium development (located near the center of this subarea) applied for a permit to construct a revetment in 1989. DLCD opposed issuance of the permit because of the apparent cyclical nature of the erosion and the fact that the area seemed to be healing naturally. Also, The Department noted that even the eroded dune was further seaward than when the Breakers were built in the early 1970's. In short, the development was no more at risk then when it was built.

Notwithstanding the erosion that has occurred, the foredune in this subarea is in relatively good condition. The healing process could be helped by planting beachgrass and adding fertilizer.

Neskowin Spit Subarea

This subarea includes the portion of the foredune immediately north of Neskowin Creek. Homes in this subarea are set in a semicircle facing west and south overlooking the creek as it crosses the beach. The foredune in this area is very narrow (only about 20 feet wide) and homes are only 25 feet back from the beach zone line.

The height of the foredune varies in this subarea. At the southern end (i.e. the southernmost six homes on about the southern 300 feet of the dune) are on a low flat plain. The area is low for the entire width of the dune, from the ocean beach landward to Neskowin Creek. 1973 aerial photos show that the entire area was an open sand spit. Geologically, this area was probably washed out by movement of the Neskowin Creek mouth or erosion during a major ocean storm.

Just north of the end of the spit the dune is dramatically taller. The seventh home from the end of the spit is six to eight feet higher than homes to the south. The dune is noticeably higher across its entire width, rising to 35 to 45 feet in height. This part of the dune is also much better vegetated with mature trees and shrubs. Together these factors suggest this area has been stable for more than 50 years.

The 1989 site visit confirmed that the homes at the end of the spit are on a low, poorly vegetated sand form. The foredune in front of these homes is very narrow (20-30 feet) and generally poorly vegetated. Riprap is visible along the southernmost six lots. There is good potential for building up the dune in this area. The beach is wide and high. Planting additional beachgrass and fertilizing could widen the dune. A wider dune would also provide a wider buffer between these homes and public beach use since the major public access to the beach in this area is along the west bank of Neskowin Creek.

The relatively narrow dune and the proximity to the creek mouth makes this area somewhat more susceptible to erosion than other areas. This might be partially offset by the proximity of Proposal Rock just offshore, which may help break up major storm waves.

Neskowin South

This subarea includes all of the dune shoreline south of the Neskowin Creek outlet. The foredune throughout this area is at or just behind the beach zone line.

The major alteration in this area appears to have been the construction of a riprap revetment on the southern 1200 feet of this unit just prior to 1978. The 1978 photos show a recently completed revetment on and at some points seaward of the zone line. The entire 1200-foot stretch was undeveloped at the time.

Between 1978 and 1984, nine new oceanfront homes were constructed along this 1200-foot stretch. All of the homes in this area are placed just landward of the beach zone line.

Farther to the south, homes are set back farther from the zone line (up to 120 feet). The 1984 aerials show that most of the area has a good beachgrass cover, although two of the lots in the 1200-foot revetment were graded.

Some erosion in this area was apparent between 1978 and 1984. The revetment area was covered with sand and had some beachgrass cover (i.e., the riprap was not readily apparent in the aerial photos). However, a 700-foot stretch of shoreline immediately south of the revetment had eroded noticeably. In 1978, the dune stretched an average of 35 to 40 feet seaward of the beach zone line. By 1984, the dune was narrower, averaging only 0 to 10 feet from the zone line.

Management Needs

The major management need in Neskowin is building up a foredune in the Breaches subarea. The five depressions in the dune in this subarea seriously compromise the dune's ability to protect inland areas from flooding. The natural build up of these breaches should be encouraged through the planting and fertilization of beachgrass.

In the Neskowin Community and Neskowin Spit subareas work is needed to repair the erosion damage on the front of the dune. This should include planting beachgrass and fertilizing. Views in these areas are obscured or threatened by dune accretion. Plantings and fertilization now could promote a wider dune that would be less likely to grow in height.

Bayshore (Alsea Spit)

Overall Assessment

Although most of the foredune at Bayshore has been relatively stable, the tip of the Alsea Spit has changed dramatically in the last fifteen years. The comparisons of 1978 and 1984 photos show that most of the area has been relatively stable, with only minor changes in dune width and vegetative cover. During this same period, the end of the spit experienced heavy erosion. Subsequent efforts to protect the spit and rebuild the dune also made major changes to the dune.

The erosion at the spit was caused by a change in the location and alignment of the Alsea River outlet. The outlet shifted north and was both closer and parallel to shore. This allowed ocean waves to penetrate closer to shore, and eroded the spit. OSU scientists studying the area concluded that the 1982-83 El Niño's effect on nearshore currents had caused the change in the river outlet. A review of aerial photography back to 1939 confirmed that the river outlet has meandered north several times with similar effects on the spit. Since the 1984 photos, the spit has begun to rebuild, to the point that windblown sand is becoming both a nuisance and a hazard to homes at the southern end of the spit.

The character of the foredune at Bayshore suggests that the spit has been subject to erosion from the Alsea River many times in the past. The southern half of the spit is low and flat, only 15 feet or so above sea level. In this area the foredune is the highest part of the dune. Further north though, the back area is progressively higher in elevation, and is level with or higher than the crest of the foredune (at 30-35 feet). This suggests that the southern half of the spit has been washed out in the past by the river, while the northern half has been a relatively more permanent feature. Also, it reinforces the importance of the foredune for the southern area. If the foredune is breached, the low-lying back areas would be either cut off (by a complete breach of the spit) or subject to direct wave attack.

The foredune throughout the southern half of Bayshore is relatively narrow and tall. In cross-section, the dune averages 70 to 150 feet in width. Oceanfront homes are typically excavated into the landward side of the foredune with living floors constructed above a daylight basement garage. Behind the foredune is a broad, low area (which may have been an old deflation plain). The area behind the foredune averages only 15 to 16 feet in elevation.

Bayshore has experienced the most rapid development of the five communities studied. The number of houses at Bayshore increased by 65% between 1978 and 1984.

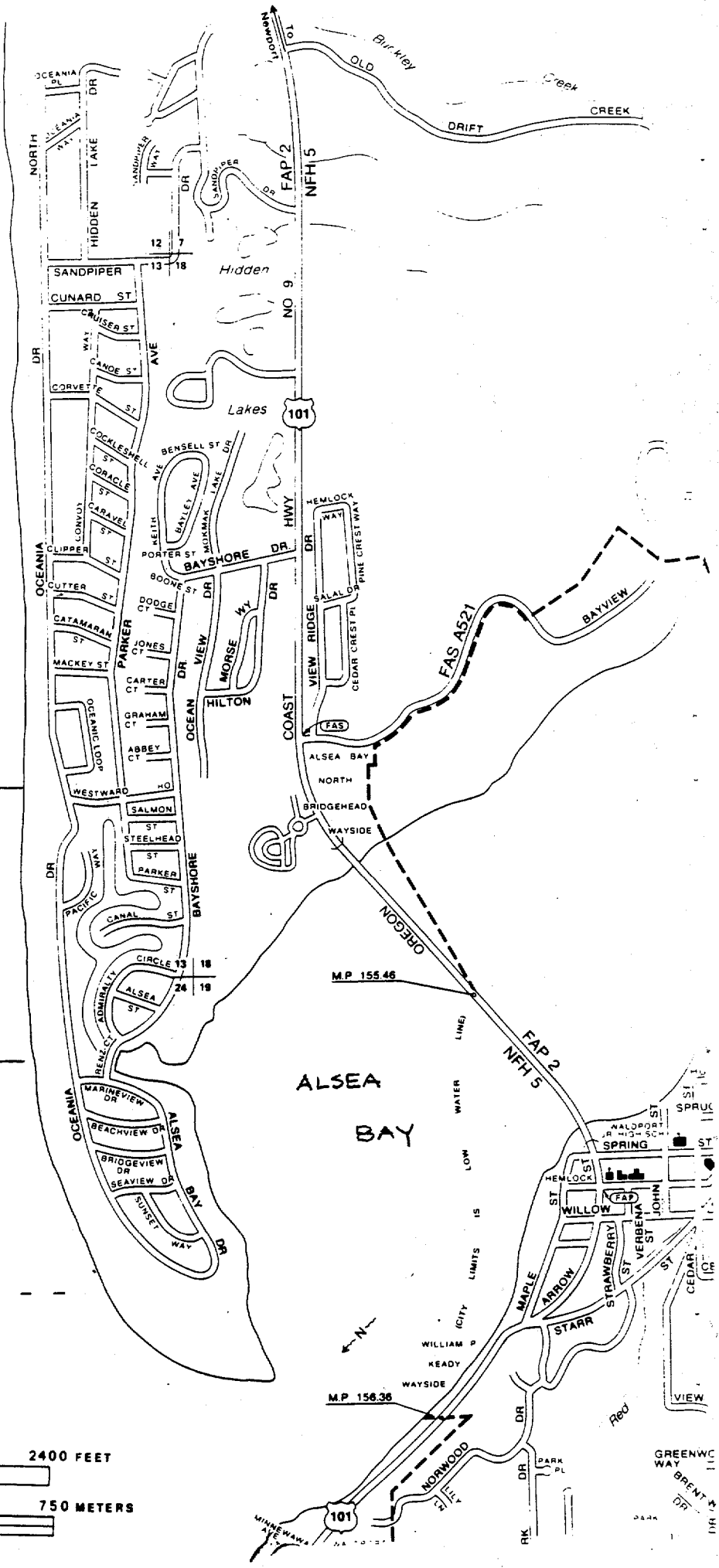
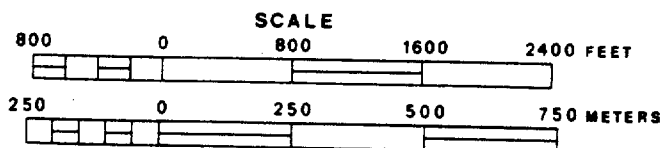
Bayshore
North

Beachclub
North

Bayshore

Beachclub
South

Spit



Subarea Assessments

BAYSHORE SUBAREA SUMMARY

| <u>Subarea</u> | <u>Length (feet)</u> | <u>Homes 78/84</u> | <u>BZL DX</u> | <u>Dune Width</u> | <u>Grass Cover</u> | <u>Flood Elev</u> |
|-----------------|--------------------------|------------------------|-------------------|-----------------------|------------------------|-----------------------|
| Bayshore North | 1400 | 17/23 | 30 | 40/40 | 80/80 | 27/28 |
| Beachclub North | 4000 | 18/28 | 45 | 65/75 | 60/90 | 29/31 |
| Beachclub South | 2000 | 7/11 | 15 | 115/115 | 40/65 | 28 |
| Spit | 2800 | 3/12 | 20 | 125/30 | 75/50 | 28 |
| TOTAL | <u>10,200</u> | <u>45/74</u> | | | | |

Bayshore North

This is the northern limit of the foredune in this area. The area just to the north is a consolidated sand terrace. The dry sand beach in this area is very narrow. Homes in this area are constructed very close to the beach zone line, averaging about 30 feet back from the line. The dune is also very narrow, only about 40 feet wide. There has been very little change in the dune between 1978 and 1984. The major alteration in this area has been the construction of six new oceanfront homes over the last ten years. As with most of Bayshore, oceanfront homes are constructed by excavating into the backside of a fairly narrow foredune.

As noted above the area landward of the foredune is as high or higher than the foredune itself. This provides some ocean views for second, third and fourth tier homes that are inland and upslope of the ocean. However, because the slope is gradual, most of these homes have an ocean rather than a surf or beach view.

A 1989 site visit revealed that the foredune in this area is accreting. A new foredune ridge is developing approximately 75 feet seaward of the dune ridge that most of the homes are built upon. This new dune is roughly 30 feet wide and about as high as the older dune on which houses are built. Between the two dunes is a low swale or trough with good beachgrass cover, although the grass in this area is less vibrant than that on the new foredune.

The newly developing foredune appears to be growing. There is good beachgrass cover on the crest and the beachgrass is vibrant and in many areas shows signs of recent burial. The dune itself has a short steep foreslope with little beachgrass cover. The result is that windblown sand is not stopped until it reaches the crest of the new dune, causing it to grow in height.

There are a few clumps of beachgrass on the foreslope. Growth in the height of the foredune could be limited by planting and fertilizing beachgrass seaward of the crest. This would trap sand further out, causing the dune to grow wider rather than higher.

Beachclub North

The foredune in this subarea is slightly broader than in the Bayshore North subarea. This suggests that sand accretion has tapered off to the north.

The major alteration in this area is the construction of ten new oceanfront homes. As noted above, homes are typically constructed by excavating into the back of the foredune. This does not appear to have damaged the foredune, though. Between 1978 and 1984, the dune actually grew about 10 feet wider. Also, beachgrass cover increased noticeably.

In 1989, this area, like the rest of Bayshore was experiencing continuing sand accretion. Limited beachgrass cover on the foreslope has resulted in sand accumulating on the crest of the dune. This problem could be minimized by planting and fertilizing beachgrass on the foreslope.

Beachclub South

The foredune eroded somewhat between 1978 and 1984. The northern end has been relatively stable but the southern end appears to have eroded about 50 feet. Erosion tapered to zero at about the middle of the unit. In short, this was a transition area between the severe erosion to the south and the relatively unchanged dune to the north. At the same time, there was a notable increase in beachgrass coverage, from 40% to approximately 65%. There has also been some limited grading in this subarea. The crest of the foredune in front of the Beachclub was graded in 1978, but had largely recovered by 1984. In 1984, grading was apparent in front of at least one developed lot. In 1986, the lot and the very southern end of this subarea were completely cleared of beachgrass.

The foredune in this subarea is the widest on the spit, averaging about 115 feet, with little change between 1978 and 1984. However, the dune is still very narrow in comparison to other developed dune areas, and the backdune areas are very low.

Although sand accretion problems are less dramatic than the spit area further south, this area is currently experiencing sand accretion. As in other areas, most of the sand is accreting on the crest of the dune.

Bayshore Spit

Changes in this subarea over the last ten years graphically illustrate the unpredictable and dynamic nature of sand spits at river mouths. In 1978, the spit was considered relatively stable and accreting. In 1982-83, a major El Niño event caused the Alsea River mouth to shift north and closer to shore. Erosion in the following two years eroded away oceanfront lots and the tip of the spit itself. In the last three to four years the river has shifted south, leaving a 700 foot wide open sand beach. Winds sweeping the beach have pushed sand back up to and over the dunes. This new accretion of sand is currently the major problem on the spit.

Background

In 1978, the foredune was relatively wide and apparently accreting. The RNKR report of Geologic Hazards in Lincoln County confirmed this conclusion. The foredune was an average of 110-120 feet wide. The back area of the dune was well vegetated (100% cover), while the foreslope throughout the area was a series of dense beachgrass clumps. The amount of beachgrass cover and the width of the foredune varied inversely from north to south. At the north end, the dune was relatively narrow and well vegetated. Farther south to the end of the spit, beachgrass coverage progressively lessened but the grass was spread over a much wider area.

Between 1978 and 1984, nine new oceanfront homes were built in this subarea. But by 1984, the southern 1200 feet of the spit had eroded back, on average, to the beach zone line--approximately 50 to 100 feet.

The sequence of erosion and accretion at Bayshore occurred something like this:

1984-85 70-80 feet of shoreline eroded along a 1600-foot stretch at the north end of this subarea; most of the shoreline was riprapped, but not until at least one home was lost. Also, an 800-foot stretch of undeveloped lots eroded to within 30 to 40 feet of the road (i.e., the spit almost breached).

1985-86 The erosion shifted south. The undeveloped end of the spit, which was 700 feet long in 1984, eroded away completely. The developed tip of the spit and the properties along the bayside were riprapped to prevent further erosion.

1987-88 Massive sand accretion was underway. During this time, the eroded lots in the northern part of this subarea were rebuilt. Starting in 1985-86, the contractor/owner of these lots graded sand washed by ocean waves from just behind the riprap further landward. As new sand was washed

in by wave action, it too was graded landward to build up the lot. Within a year, the lots were substantially rebuilt. In 1987-88, substantial sand accretion began to occur and sand was blowing up over the now reconstituted dune. Beachgrass was planted and sand fences were placed, but the extent of accretion exceeded the capacity of both the grass and sand fences.

1989 Status

There are three distinct areas within this subarea. At the extreme southern end is the tip of the spit. Just north of that is a 700 foot stretch of vacant lots that eroded in 1984 and 1985, protected with riprap and then rebuilt through placement of sand fences and other measures. To the north is an area that was largely unaffected by the earlier erosion but which is experiencing substantial sand accretion. While the condition of the crest of the dune varies between these three areas, the foreslope is typically short, steep and poorly vegetated. Seaward of the foreslope is a broad flat berm created by the placement of two parallel rows of driftwood in 1987-88. There are scattered clumps of beachgrass throughout this berm area.

There are seven homes on the nine lots at the southern tip of the spit. The condition of the dune in front of these houses varies. A couple have good vegetative cover, but most of the lots have only 50% or less coverage. Two houses built within the last year have apparently graded the dune and not replanted beachgrass. Throughout this area vegetative cover is limited to the crest of the dune. There is little or no beachgrass on the foreslope or out onto the broad beach berm. The dune here is presently some 750 feet landward of the high tide line.

The 700 foot area of eroded and rebuilt lots is a second distinct subunit in this subarea. Because these lots were planted and fertilized in 1987-88, they have excellent beachgrass cover. However, cover is more sparse at the northern end. The condition of the dune in May-June 1989 suggests that the rebuilt dune is "full" and that the rate of accretion is exceeding the ability of the dune to stabilize windblown sand.

In 1988, driftwood on the beach was placed in two parallel rows about 100 and 150 feet seaward of the toe of the planted foredune. This driftwood acted as a sand fence, collecting windblown sand. By May 1989, these makeshift fences were full and sand was burying European beachgrass at the toe of the foreslope. Excess sand was blowing over the dune and collecting on Oceania Drive and starting to build a second dune inland of the road.

The third subunit in this area consists of twenty houses and vacant lots north of the rebuilt lots. These houses and lots, particularly the ones just north of the rebuilt lots, are being inundated with windblown sand. Southwest winds are building up

the crest of the dune as well as causing sand to buildup around existing homes. The problem is particularly acute at the north end because of the inadequate beachgrass cover on the rebuilt lots just to the south.

The result of this accretion is a foredune crest which is growing up in front of and around oceanfront homes. For most homes, growth in the dune has completely blocked the views from first floor windows and reduced or eliminated beach and surf views from the second floor. Growth of dunes on vacant lots has resulted in dunes as high as adjacent homes and led to spillover of sand onto side lots.

Accretion of sand has been a major maintenance problem for oceanfront homeowners. Sand is building up on three sides of many homes, blocking doors and windows and requiring regular digging to keep the house accessible. Concern about this maintenance problem led three oceanfront homeowners to illegally grade the foredunes in front of their homes in June 1989. The dune was graded flat, in spite of instructions from DLCD and other agencies that grading was only permitted to remove accumulations around oceanfront homes.

Management Needs

The continuing accretion at the end of the spit is the major management problem in Bayshore. Excess sand needs to be stabilized forward of the oceanfront homes. This should enhance protection of the area in the next erosion event. (The OSU study confirms that the tip of the spit has experienced several similar episodes of erosion over the last 50 years.) The second major management need is to widen the foredune throughout this area. The southern half of Bayshore is particularly susceptible to ocean flooding because of the narrow foredune and the low elevation of areas behind the foredune.

Accretion is a major problem because of the amount of sand being moved and because there is little or nothing to stop it before it reaches the oceanfront homes. Interestingly, despite the massive accretion of sand, the dune at the south end of the spit has grown relatively little in width. The recommended solution throughout Bayshore is to stop windblown sand before it reaches the crest of the foredune. Basically, this would result in the dune growing wider (in a seaward direction) rather than higher.

During the 1989 site visit, Wilbur Ternyik of Wave Beachgrass Nursery in Florence, outlined a program for dealing with the sand accretion problem. The first step would be placement of two new parallel rows of sand fences the length of this subarea. (From the tip of the spit to approximately 400 feet north of the rebuilt lots.) The sand fence would collect windblown sand which is now causing accretion problems. Once the fences fill with sand the area would be planted with beachgrass and fertilized. Together these measures should capture windblown sand seaward of the existing dune, largely cutting off accretion to inland areas.